TECHNICAL STANDARD AND INFRASTRUCTURE REQUIREMENTS

Part 2

BROADCAST NETWORK INFRASTRUCTURE

MTSFB 006 : 2005 (Revision 1)

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Committee Representation

The Broadcast Network Infrastructure Sub Work Group operates under the wing of the main Multimedia Network Infrastructure (MNI) Work Group which is supervised by the Malaysian Technical Standards Forum Bhd (MTSFB) authorized by Malaysian Communications and Multimedia Commission (SKMM). The TSIR- Broadcast Network Infrastructure document was developed by various members whom are representatives from the following Broadcasters, Cabling manufacturer, Government Agencies, Manufacturer Associations and Professional Bodies, namely:

AMP Connectors Sdn Bhd
Association of Consulting Engineers, Malaysia
CableView Services Sdn Bhd (Mega TV)
Celcom Communication Sdn Bhd
Construction Industry Development Board, Malaysia
Datacraft Malaysia Sdn Bhd
Department of Standards, Malaysia
Dewan Bandaraya Kuala Lumpur
Diamond Components Sdn Bhd
DiGi Telecommunications Sdn Bhd
Institution of Engineers, Malaysia
Jabatan Bomba Dan Penyelamat, Malaysia
Jabatan Kerja Raya, Malaysia
Leader Optic Fiber Cable Sdn Bhd
Malaysian National Computer Confederation
MAXIS Communication Sdn Bhd
Measat Broadcast Network Systems Sdn Bhd
MiTV Corporation Sdn.Bhd.
Natseven TV Sdn Bhd
SIRIM Berhad
Sistem Televisyen Malaysia Berhad (TV3)
Telekom Malaysia Berhad
Zettabits Technologies（M）Sdn Bhd

Foreword

This Technical Standard and Guidelines was developed and recommended by the Cabling and Infrastructure Working Group in order to introduce Technical Codes and Standards for Broadcast Network Infrastructure. The development of this Technical Codes was carried out by this working group under the supervision of the Malaysian Technical Standards Forum Bhd (MTSFB) which has been authorized by Malaysian Communications and Multimedia Commission (SKMM).

The Technical Standard and Infrastructure Requirements (TSIR) documentation is intended as a reference for technical codes and standards for architects, consulting engineers, owners, developers and others who are responsible for planning and erecting buildings. This is inline with the objective to meet the requirement of end users on broadcasting services (telecommunication) with minimum disruptions to all services offered by service providers.

TSIR consists of 5 main modules which are as follows:

Part 1: Fixed Network Infrastructure

Part 2: Broadcast Network Infrastructure

Part 3: Radio Communication Infrastructure

Part 4: Wireless Network

Part 5: Occupational, Safety and Health Work Practices (OSHWP)

NOTE:
Compliance with a Technical Standard does not of itself confer immunity from legal obligations.

WORKING GROUP OBJECTIVES

(a) To provide the **minimum technical specifications** necessary for the broadcast broadband distribution system to function as required in buildings.

(b) To recommend and provide standards for in-building infrastructure requirements applicable in Malaysia.

WORKING GROUP SCOPE

(a) To develop and recommend minimum requirements for in-building system infrastructure.

(b) To include Security, Safety, Quality of Service, Performance Specifications, Installation Guidelines, Testing Procedures, Regulatory Requirements and other recommendations.

(c) Reference standards to relevant Regulatory Bodies that has jurisdiction.

TECHNICAL STANDARD AND INFRASTRUCTURE REQUIREMENTS
Part 2 : BROADCAST NETWORK INFRASTRUCTURE

1. Introduction

The Broadcast Network Infrastructure forms a part of the Technical Standards and Infrastructure Requirements (TSIR) document which serves as guidelines and standards in support of the Uniform Building By-Laws (UBBL). This document was prepared with the common understanding and agreement among the Broadcasters' representatives in Malaysia. This sub-working group committee called **Broadcast Network Infrastructure** is formed under the **MNI Work Group,** approved by **MTSFB**.

In the context of meeting the needs of Telecommunication (Broadcast services) users, TSIR addresses the technical system and infrastructure requirements necessary for having the broadcast broadband distribution system equipped in the building. This is important in view of Broadcast Services which are used as a medium for delivery of public information to the masses especially during crisis and emergency situations.

1.1 Document Objective

AS STATED ABOVE, THE BROADCAST NETWORK INFRASTRUCTURE IN THE TSIR DOCUMENT COVERS TWO PRIMARY OBJECTIVES:

(a) It outlines the *infrastructure requirements* (for the purpose of setting up a common and integrated broadcast distribution system) to consulting engineers, developers, owners and other responsible parties for the *provisions* to be made available in the buildings.

(b) It also provides the *minimum technical specifications* necessary for the broadcast broadband distribution system to function as required in buildings.

1.2 Document Scope

THE BROADCAST NETWORK INFRASTRUCTURE COVERS THE FOLLOWING FOCUS AREAS:

(a) System infrastructure requirement in building (condo/apartment, low cost flats, single dwelling and office buildings).

(b) Installation guidelines and standards.

(c) Technical and performance specifications for the services (including Test Procedures).

1.3 Representation

The representatives in Broadcast Network Infrastructure sub-workgroup who document the TSIR are among the Broadcasters namely, RTM, TV3, NTV7, MiTV and Astro.

2. Building Requirements for Broadcast Network Infrastructure

2.1 Outdoor Requirement

2.1.1 Roof Space / Allocation

Space on the roof top for installation of the receiving antenna and satellite dish shall be provided. The minimum roof top space area required is $9m^2$ on a flat horizontal surface dedicated for installation of antennas and satellite dish without any obstructions.

Developer is strongly advised to consult the broadcasters on the appropriate selection of the space to be allocated. This is to ensure that the antenna can be installed at a position where the signal strength is strong and steady without ghosting and interference. The space allocated should be able to withstand hacking and hammering not exceeding 1.0 kg /m^2 weight. The space should not be higher than the building lightning conductors and must not have any interference from any Telecommunication equipments.

2.1.2 Antenna / Dish Location

Where no suitable site can be found because of "shadowing" by other taller building, an aerial pole maybe erected. No link-up by overhead cable from aerial to block or block to block is allowed. Underground linking to another block for better TV reception is allowed.

2.1.3 Protective Devices

Lightning conductors for the antenna mast should be installed and connected to the main building grounding system.

2.1.4 Stability / Security

Developer should provide a ladder (if necessary) on the rooftop so that the antenna mounting and the lightning connections can be inspected. Guy wires must be positioned to support the antenna mast against strong wind when necessary.

2.1.5 Electrical Requirement

A minimum of 2 nos. of 13 amp switch socket outlet is to be made available. All socket installed shall be adequately protected from rain and rust.

2.2 Head-End Requirement

2.2.1 Space Requirement

The developer must dedicate a room with security lock to locate all broadcast services head-end equipment, identified as the BROADCAST/TRANSMISSION HEADEND room.

The BROADCAST / TRANSMISSION HEADEND room shall be placed on the rooftop area nearest to the antenna fixtures and should be located free from perceptible vibration. Ducting, sewage pipes, air condition pipes etc. shall not pass through the BROADCAST / TRANSMISSION HEADEND room. Refer to Table 1 for details.

2.2.2 Electrical Requirement

The BROADCAST / TRANSMISSION HEADEND room shall be equipped with a 20A TPN metal clad DB of 20A. The DB should be equipped with the following:

a) ELCB (Earth leakage Circuit Breaker).

b) ARS (Automatic Restoration System); a auto re-closure device that works with the ELCB - to normalize the power system for ensuring minimum system downtime and site attendance.

c) Surge protection system of 40KA and

d) 20-way MCB (buildings with 6 floors and above).

The electrical supply should be connected to the essential power generator if provided. An earth leakage circuit breaker shall be installed inside the room.

The BROADCAST / TRANSMISSION HEADEND room shall be equipped with daylight type fluorescent lighting that can provide a minimum of 300 Lux luminance at floor level. The earthing system should have a resistance to earth of not greater than 10 ohm (Ref: BS6651 and IEC60364-1), and be terminated on an earth bus bar inside the room. The main earth conductor should have a cross section of not less than 70 mm^2 via the shortest routing. The earthing system should be extended vertically downwards to the ground via the riser duct.

2.2.3 Temperature/Ventilation

The BROADCAST / TRANSMISSION HEADEND room shall be air-conditioned or equipped to maintain humidity and room temperature at 30% to 50% relative humidity and below 30ºC respectively under all conditions. The room shall be fitted with a ventilation fan system capable of 30 air change/min, activated when the room temperature rises above 35ºC.

2.2.4 Accessibility

There should be no opening in the BROADCAST / TRANSMISSION HEADEND room except for the door, the ventilation and cabling ducts. The door dimension shall be 1m X 2.5m. All windows if any must be shut and sealed along the frames to keep out water and dust and blind should be provided to avoid direct sunlight. Solid walls should be provided for heavy equipment mounting. The walls and ceiling should be of normal finishing or be painted with light-colored vinyl emulsion or gloss paint. Floor of the BROADCAST / TRANSMISSION HEADEND room shall be of material that is easy to clean and not susceptible to accumulation of dust, flooring requirement is anti-static vinyl type mat and bonded to the earth bus bar. The room must be flood free. A 150 mm kerb across the doorway is required to prevent water from entering the room.

2.2.5 Security

The BROADCAST / TRANSMISSION HEADEND room shall be locked at all times and only authorized personnel be allowed access. The key for this room shall be kept by the owner or the building manager of the building and made available to authorized personnel when required. No water tank, main water drainage pipes should be installed directly above the room. Developer should observe all relevant ordinance and regulation regarding the fire safety requirements during the design of the BROADCAST/TRANSMISSION HEADEND room, by having:

a) Portable hand-operated fire extinguisher and

b) Emergency lighting connection to backup power supply

Smoke detection device should be installed inside the BROADCAST/TRANSMISSION HEADEND room and be connected to the central control of the building management office. The room should be fitted with a fire door as per “Jabatan Bomba dan Penyelamat Malaysia” approval.

The BROADCAST / TRANSMISSION HEADEND room floor space dimension for each type of building can be referred as in Table 1 below:

Table 1. BROADCAST / TRANSMISSION HEADEND Room Floor Space

Building Type	Floor Space (L X B X H)	# Floor / Wall Opening (W X D)	Door Opening (W XD)
a) Condo / Apartment			
x < 6 floors	3m X 4m X 3m	0.4m X 0.15 m	2.5m X 1m
6 < x < 16 floors	3m X 4m X 3m	0.6m X 0.15m	2.5m X 1m
x > 16 floors	3m X 4m X 3m	0.9m X 0.2m	2.5m X 1m
b) Low cost Flats			
x < 6 floors	3m X 4m X 3m	NA	2.5m X 1m
6 < x < 16 floors	3m X 4m X 3m	0.6m X 0.15m	2.5m X 1m
x >16 floors	3m X 4m X 3m	0.9m X 0.2m	2.5m X 1m
c) Single Dwelling			
Bungalow	NA	NA	NA
Semi-Detached	NA	NA	NA
Terrace Single Storey	NA	NA	NA
Terrace Double Storey	NA	NA	NA
Low cost	NA	NA	NA
d) Office Building			
x < 6,000m^2	3m X 4m X 3m	0.7m X 0.15m	2.5m X 1m
6,000m^2 < x < 20,000m^2	3m X 4m X 3m	1.0m X 0.2m	2.5m X 1m
20,000m^2 < x < 60,000m^2	5m X 6m X 3m	1.1m X 0.2m	2.5m X 1m
x > 60,000m^2	5m X 6m X 3m	1.1m X 0.2m	2.5m X 1m
e) Shop house			
x < 6 storey	Requirement to be determined case by case	Requirement to be determined case by case	Requirement to be determined case by case
f) Others			
Industrial Lot	Requirement to be determined case by case	Requirement to be determined case by case	Requirement to be determined case by case
Hotel			
Schools			
Hospital			
Club house			

NOTES:

1. NA implies Not Applicable

2. # Two opening is required i.e. one serve the antenna cable access and the other serve the riser cable distribution.

2.2.6 Riser

To obtain maximum benefit from the distribution system, the riser duct should be placed centrally with respect to the distribution in which it is to serve. To facilitate the installation and maintenance of horizontal cables, the distance between the riser duct and the outlet point in the home unit should be kept as short as possible that is less than 30 meters. A 150 mm high kerb shall be provided across the doorway to prevent water from getting in. For low cost building the cable riser shall be sited in easily accessible area inside the building like staircase landing area.
The following services are not allowed to share this riser:[

a) Water piping.

b) Fire fighting.

c) Building Electrical System.

d) Gas distribution and

e) Any other services that may cause moist, danger or any harmful effect on human life

2.2.7 Riser Size / Working Space

The size of the riser shall be based on the type of building as in Table 2 below:

Table 2. Riser size

Building Type	RISER		
	Cable Trunking	Floor Opening (W X D)	Closet Space (W X D)
a) Condo / Apartment			
x < 6 floors	100mm x 75mm x3	0.4m X 0.15m	0.9m X 0.6m
6 < x < 16 floors	150mm x 100mm x3	0.6m X 0.15m	1.2m X 0.6m
x > 16 floors	150mm 100mm x3	0.9m X 0.2m	1.5m X 0.8m
b) Low cost Flats			
x < 6 floors	100mm x 75mm x3	NA	NA
6 < x < 16 floors	150mm x 100mm x3	0.6m X 0.15m	1.2m X 0.6m
x > 16 floors	150mm x 100mm x3	0.9m X 0.2m	1.5m X 0.8m
c) Single Dwelling			
Bungalow	NA	NA	NA
Semi-Detached	NA	NA	NA
Terrace Single Storey	NA	NA	NA
Terrace Double Storey	NA	NA	NA
Low cost	NA	NA	NA
d) Office Building			
x < 6,000 m^2	150mm x 100mm x3	0.7m X 0.15m	1.2m X 0.9m
6,000m^2 < x < 20,000 m^2	150mm x 100mm x3	1.0m X 0.2m	1.5m X 0.9m
20,000m^2 < x < 60,000 m^2	150mm x 100mm x3	1.1m X 0.2m	1.8m X 1.2m
x > 60,000m^2	150mm x 100mm x3	1.1m X 0.2m	1.8m X 1.2m
e) Shop house			
x < 6 storey	100mm x 75mm x3	NA	NA
f) Others			

Building Type	RISER		
	Cable Trunking	Floor Opening (W X D)	Closet Space (W X D)
Industrial Lot	Requirement to be determined case by case		
Hotel			
Schools			
Hospital			
Club house			

2.2.8 Riser Arrangement

Vertical closed cable trunking and the riser can be shared between BROADCAST services, and other TELECOMMUNICATION services. The arrangement of these cables in the riser shall be as follows:

a) From the left is for RADIO COMMUNICATION (Cellular Network) services.

b) The center is for TELECOMMUNICATION services and

b) From right side is for BROADCAST services.

Closed trunking shall be used and shall be solidly grounded to provide shielding between different services. The trunking shall be galvanized steel plate, epoxy powder coated against corrosion with a finishing of light blue paint. The Broadcast horizontal conduit / trunking shall be separated and dedicated to related services such as follows:-

a) Off-Air Broadcast TV Services.

b) Digital Satellite TV Transmission.

c) Cable TV Services and

d) Interactive Digital Services.

Sharing of services apart from those listed above is strictly prohibited.

The size of the horizontal trunking along the corridor shall be according to the number of cables as shown in Table 3.

Table 3. Horizontal trunking

Number of Cables	Size of Trunking on Floor (mm X mm)	Size of Trunking on Ceiling (mm X mm)
Less than 10	1 no. 100 x 25	1 no. 100 x 50
10 to 20	2 nos. 100 x 25	2 nos. 100 x 50
More than 20	NA	Comply to 50% space factor

The size of the horizontal drop cable into the individual unit shall be using at least a PVC conduit of 19 mm diameter. All conduits or cable enclosure need to be completely concealed and should not protrude so as to reduce the aesthetics either within or outside the customer premise.

2.2.9 Accessibility

Access to each riser will be necessary on each floor and should always be available from a corridor or other common area to avoid undue disturbance to occupants. The riser shall have a hinged and locked door on every floor and it is important that it be fire proof. The riser door key shall be kept by the building owner for safe custody.

2.2.10 Electrical Requirement

The riser shall be fitted with sufficient florescent lighting to facilitate work and the word "TELECOMMUNICATION SERVICES" shall be displayed on the door of the riser closure. A minimum of 2 nos. of 13 Amp power sockets shall be provided at the alternate building floor in the riser to cater for the need of BROADCAST services distribution equipment. However if needs arise for larger blocks (i.e. more than 10 apartment units per floor), 2 nos. of 13 Amp switch socket outlets for every floor is recommended.

2.3 Home Unit

2.3.1 Broadcasting Outlet

The recommended number of outlets shall be based on the type of building as in Table 4 below:-

Table 4. Number of broadcasting Outlet Socket for Home Unit

Building Type	Recommended Number of Socket
a) Condo / Apartment	
x < 6 floors	3 X Sat / TV / Radio
6 < x < 16 floors	
x > 16 floors	
b) Low cost Flats	
x < 6 floors	2 X Sat / TV /Radio
6 < x < 16floors	
x > 16 floors	
c) Single Dwelling	
Bungalow	5 X Sat /TV /Radio
Semi-Detached	3 X Sat/TV/Radio
Terrace Single Storey	2 X Sat/TV/Radio
Terrace Double Storey	3 X Sat/TV/Radio
Low cost	2 X Sat/TV/Radio
d) Office Building	
x < 6,000m^2	Requirement to be determined Case by Case
20,000m^2 < x < 60,000m^2	
x > 60,000m^2	
e) Shop house	
x < 6 storey	Requirement to be determined case by case
f) Others	
Industrial Lot	Requirement to be determined
Hotel / Service apartment	
Schools	

Hospital	Case by case
Club house	
Shopping complex	

Every broadcasting outlet in the main/ living room must be adjacent to additional or parallel to TELECOMMUNICATION socket to facilitate upcoming interactive services which will require feedback channel over PSTN lines. The wall outlet points should be aesthetically installed with safety and convenience given consideration. The outlet point should be at least 0.3 m above the floor level and 0.3 m from the corner of the wall or from electrical points. Wall outlet boxes and plates shall be fabricated from non-corrosive material or from metallic material treated to resist corrosion.

2.3.2 Location for the Broadcasting Outlet

The locations of the broadcasting outlets are defined in table 5 below:

Table 5. Location of Broadcasting Outlet Socket

Building Type	Location
a) Condo / Apartment	
x< 6 floors	1 X Living Room 1 X Master Bed room 1 X Bedroom
6 < x < 16 floors	
x > 16 floors	
b) Low cost Flats	
x < 6 floors	1 X Living room 1 X Master bedroom
6 < x < 16 floors	
x > 16 floors	
c) Single Dwelling	
Bungalow	1 X Living room , 1 X Master bedroom, 3 X Bedroom
Semi-Detached	1 X Living room, 1 X Master bedroom , 1 X Bedroom
Terrace Single Storey	1 X Living room, 1 X Master bedroom
Terrace Double Storey	1 X Living Room , 1 X Master bedroom 1 X bedroom
Low cost	1 X Living Room, 1 X Master bedroom
d) Office Building	
x < 6,000m^2	Requirement to be determined case by case
20,000m^2 < x < 60,000m^2	
x > 60,000m^2	
e) Shop house	
x < 6 storey	Requirement to be determined case by case
f) Others	
Industrial Lot	Requirement to be determined case by case
Hotel	
Schools	
Hospital	
Club house	
Shopping complex	Requirement to be determined case by case

Developer should provide provision for additional wall socket in other location in the room, not already specified in Table 5 to meet the requirement of the occupant.

3 Technical Information

3.1 Broadcast Broadband Systems (BBS) Configuration

The Broadcast Broadband System is the means by which many apartment houses hotels, schools and other multi-unit buildings distribute TV and FM radio signals to a number of receivers. In order to accomplish this without a loss of signal quality, these systems must be carefully planned and engineered through the effective use of BBS equipment and techniques.

The Broadcast Broadband System is basically a network of cables and specially designed components that process and amplify TV and FM radio signals and distribute them from one central location.

The system shall be designed to receive clear and interference free color television and FM Radio transmission. The signals received at the wall outlets should be according to Section 5.4 Performance Specifications for all services within the Broadcast Broadband System under clear sky reception condition. A standard system impedance of 75 ohms shall be used.

The BBS system concept can be separated into two divisions: the Head End and the Distribution System.

A well-designed distribution system is necessary to guarantee that an adequate signal will be delivered to every receiver. It should provide a clean signal to the sets by isolating each receiver from the system and by delivering the proper amount of signal to each set. This portion of the system consists of trunk lines, splitters, feeder lines, and tap-off. Some of the other equipment used includes line taps, variable isolation wall taps, coaxial cable, and band separators.

3.2 Head End Equipment

3.2.1 Antenna and Satellite Dish

The BBS installation use broadband antennas (terrestrial television). However, if the channels to be received are in different directions or if adjacent channel reception is desired, a single channel antenna may be required.

The channel antenna to be installed should have sufficiently high gain, directivity, flatness of response, front-to back ratio and matched output over the entire band.

An antenna should be suitable for receiving the relevant channel. It should be securely mounted at favorable position to enable reception of maximum signal strength. Disturbances due to reflection of transmitted signals should also be taken into considerations when choosing and antenna, and phase shifter or ‘ghost’ eliminating devices should be used, where it is deemed necessary. The number of channels to be received, the directions to the transmitters, the type of signals (UHF, VHF, FM), and the available signal levels all must be considered when designing an antenna requirement.

The antenna supporting structures including base guys swivel and other accessories shall be resistant to rust and corrosive atmospheric contaminants. Galvanizing of metallic articles for resistant to rust shall comply to MS739 and MS740. All contact shall be of similar metals or

suitably designed otherwise to prevent electrolytic action taking place, causing corrosion. The cross-arm and elements shall be of high-strength aluminum alloy.

3.2.2 Terrestrial Antenna (typical antenna guide)

Band Antenna for VHF I

Channel	:	2 to 4
Elements	:	3 to 8
Gain	:	3 dB to 5 dB
Front to Back Ratio	:	9 dB to 12 dB
Wind load	:	45 N to 62 N
Weight	:	3 Kg to 35 Kg

Band Antenna for VHF II (FM Radio)

Channel	:	R1 TO R5
Elements	:	> 4
Gain	:	> 6dB

Band Antenna for VHF III

Channel	:	5 to 12
Elements	:	8 to 18
Gain	:	9 dB to 12 dB
Front to Back Ratio	:	16 dB to 25 dB
Wind load	:	63 N to 77 N
Weight	:	6 Kg to 45 Kg

Band Antenna for UHF IV / V

Channel	:	21 to 69
Elements	:	9 to 18
Gain	:	25 dB to 30 dB
Front to Back Ratio	:	25 dB to 30 dB
Wind load	:	39 N to 209 N
Weight	:	9 Kg to 45 Kg

3.2.3 Antenna for MMDS

Integrated antenna with Down Converter

Integrated gain	:	38 dB to 50 dB
Gain	:	32 dB

Noise figure	:	1.7 dB

3.2.4 Satellite Ku Band Dish

A parabolic antenna to be installed shall be specifically meant to receive the satellite transmitting signal. To receive the incoming satellite signal, the 60cm or 85cm Satellite Dish, mounting kit and its accessories would to be installed on top of the building and will be facing to the specific direction.

Dish Size	:	60 cm or 85 cm
Gain at 11.2 GHz	:	35.4 dB to 38.9 dB

3.2.5 Amplifiers

Amplifiers are used to increase the strength of received signals to a level greater than the losses in the distribution system. This provides an acceptable level to all components in the system.

The amplifier's specifications should be checked carefully to make sure that the output level is sufficient to feed the system and that the strength of the input signal plus the gain of the amplifier does not exceed its rated maximum output capability. Exceeding the maximum output capability will result in overloading (cross modulation in broadband amplifiers) and overall signal distortion.

There are two types of amplifiers: broadband and single channel amplifiers. Broadband amplifiers are more common type, provide a closely uniform gain across the entire band while the single channel amplifiers allow complete control of both the gain and the output level of individual channels. The latter are usually used in the head-end.

3.2.6 Broadband Amplifier

Recommended Parameters

Frequency Range	:	5 MHz to 2,150 MHz
Gain	:	35 dB
Max Output Level	:	110 dBµV
Noise Figure	:	≤ 8 dB
Connection	:	F Connector (75 Ohm)
Operating Temperature	:	50 ^{o}C

3.2.7 Single Channel Amplifier

Recommended Parameters

Amplifiers Module	:	Specific Channel
Gain	:	20 dB to 45 dB
Max Output Level	:	125 dBuV
Connection	:	F Connector (75 Ohm)
Operating Temperature	:	50 ^{o}C

3.2.8 Pre-amplifiers

In weak signal areas, it is often necessary to amplify the signal prior to the distribution amplifier in order to get a signal of sufficient strength and acceptable quality. In addition most BBS pre-amplifiers act as 300 – 75 Ohm matching transformers, eliminating the need of balun.

Noise is seen on the TV as snow, so whenever a pre-amplifier is needed, it is important to choose a unit with low noise figure. Because the noise figure of the pre-amplifier establishes the noise figure of the entire system. The pre-amplifier should always increase the signal as much as more than it increases the noise. The amplitude of the noise must be kept small in relation to the amplitude of the desired signal.

3.2.9 Modulators

A modulator accepts video source and audio source and combines them onto a single RF channel. Audio and video modulation levels may be adjusted for optimum performance based on the output level desired.

3.2.10 Filters

Channel Rejection Filters cleanly suppress an entire 7 MHz - 8 MHz wide TV channel so that another video source can be inserted in its place. Filters are used in the head end to eliminate undesired frequencies and provide interference-free reception. Filters and other head end equipment (except baluns and pre-amplifiers) are mounted indoors. They should be readily accessible for adjustment and servicing.

Band Pass Filters permit a desired range of frequencies to pass through the line, while they greatly attenuate all signals on either side of the desired range.

3.2.11 Attenuators

As signals are picked up by an antenna or by a combination of antennas, there may be a wide variation in signal levels. In order to ensure the same picture quality on all channels, the signal levels should be equalized to prevent the stronger signals from overriding the weaker ones. This is accomplished with the use of attenuators, which reduce the incoming stronger signals, by a specified amount.

Attenuators can be either fixed or variable That is, they are either designed for one specific attenuation level, or they are switch-able so that the signals can be reduced, in increments, to the exact level required. Since attenuators reduce all signals that pass through them by the same amount, the frequencies to be reduced should be separated from the rest of the signals so that only the stronger signals are reduced.

3.3 Broadband Distribution System

3.3.1 Co-Axial Cables

All co-axial cables used shall be of low loss and shielding shall be maintained with normal bending and pulling encountered during installation. The characteristic impedance should be 75 Ohm.

Cable specification shall be at least equivalent or better than the *Annex A* and *B*.

3.3.2 Splitters

The coaxial cable that carries the signal away from the head-end toward the TV sets is called the main trunk line. Occasionally Broadcast Broadband Systems operate with a single trunk line, but it is usually more efficient to separate (split) the signal into several lines for distribution to the receivers. This is accomplished with the use of a line splitter. Line splitters split the signal into 2, 3 or 4 separate lines. Splitters divide the input signal equally, providing the same amount of signal at each output of the splitter.

The splitter shall be of broadband made of diecast material and complete with coaxial cable connects to facilitate connection without opening the housing.

Recommended Parameters

Frequency range	:	5MHz - 2150MHz
F Connector	:	Yes
Earthing connections	:	Yes
Impedance	:	75 ohm

3.3.3 Tap-Offs

A tap-off is a means of delivering signal from the distribution lines to the television sets, while providing enough isolation to prevent the sets from interfering with one another. Tap-offs divide input unequally, sending the smaller portion of the signal to the set. The larger portion is sent further down the line.

Each set in a Broadcast Broadband System should get approximately the same amount of signal. However, because of the losses involved in any distribution system there is more signal available to sets closer to the amplifier than to sets further down the line. Therefore, tap-offs are made with various values of isolation rather than with a single value in order to achieve a balanced signal distribution.

Tap off shall be of broadband, low insertion losses and high isolation units housed in a diecast body. Provision shall be made for easy connection and tap off positions.

Recommended Parameters

Frequency range	:	5 – 2150 MHz
F Connector	:	Yes
Earthing connections	:	Yes
Impedance	:	75 ohm

3.3.4 Wall Sockets (Broadcast Outlets)

The 3-connector wall outlet (Radio -TV - SAT) shall be suitable for all FM, TV and satellite receivers. It shall be suitable for flush mounted and fully shielded. The output impedance for the FM, TV and SAT socket shall be 75 ohms.

a) Satellite socket shall be female F-type (IEC 169-24 Female).

b) TV socket shall be male type (IEC 169-2 Male) and

c) Radio socket shall be female type (IEC 169-2 Female).

3.3.5 Consideration When Implementing The System

3.3.5.1 Cable Loss

A certain amount of signal will be lost as it travels through coaxial cable. This loss is dependent on two factors: the type of cable used and the frequency of the signal being carried. Losses are greater at higher frequencies.

3.3.5.2 Splitter Loss

When a two-way splitter is used in the system, there will be approximately 3.5 dB to 4.0 dB losses. With a 4-way splitter used there will be 6.5 dB to 7.2 dB losses.

3.4 Typical System Design

System design is very crucial in determining the signal level and picture quality at high-rise building (homes) which uses the Broadcast Broadband System (BBS). System design varies from one consultant to another, but the ultimate result is to provide good picture quality at individual homes by following the standard requirement.

A Broadcast Broadband System Schematic must be prepared in detail for every block prior to any installation work related to the system.

Critical elements to be included in the system schematic diagram:

a) Signal level at Head-end reception.

b) Signal level at every active and passive components.

c) Signal level at the broadcast wall socket outlet and

d) Cable type recommended to be used.

Annex C shows an example of the typical design of a Broadcast Broadband System schematic diagram

4. Installation Guidelines

4.1 Outdoor Installation

The outdoor installation will consist of the following:

a) Antenna.
b) Satellite Dish.

c) Pole & Bracket.

d) Cable.

e) Metal Conduit.

f) Trunking and

g) Grounding

4.1.1 Antenna

The antenna is the first component of the Broadcast Broadband Services, which receive the broadcast signal. A good quality antenna and good antenna installation is necessary to receive good quality signal throughout the Broadcast Broadband system. As some transmitters in Malaysia are located in different sites, 1 antenna per band per transmitter site is needed to be installed

4.1.2 UHF/VHF Antenna Installation

For the Broadcast Broadband system, the height of the antenna must be lower than the height of the lightning conductor rod. The distance between the antenna and any power lines should be at least 2 times the combined height and length of the antenna. All antennas should be directed toward the transmitter stations. The minimum distance between antennas should be at least 1000 mm. Refer to figure 1. Antenna installation should be planned in such a way that the line of sight of one antenna is not obstructed by others. The center of the gravity of the antenna installation shall be well designed to minimize wind load effects.

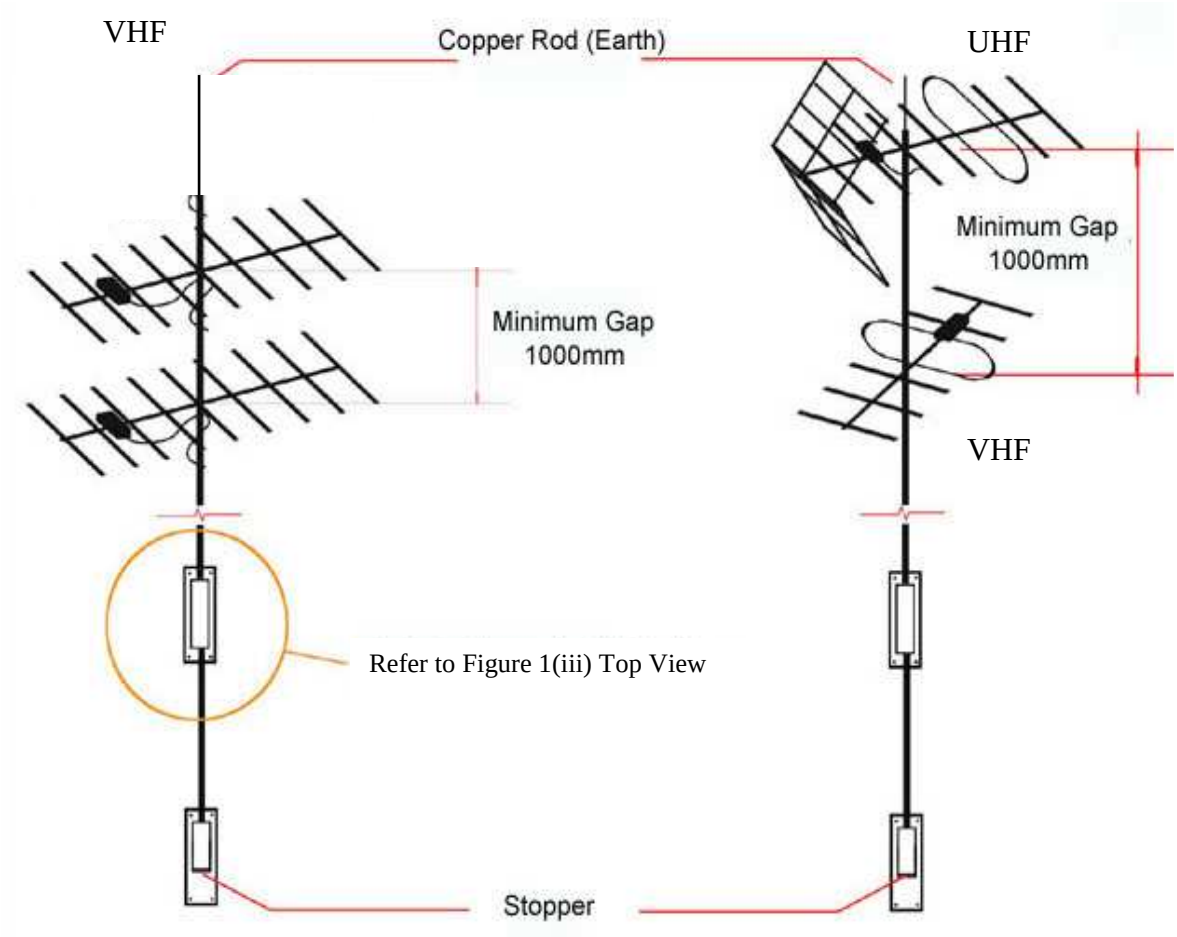


Figure 1 (i) Front View

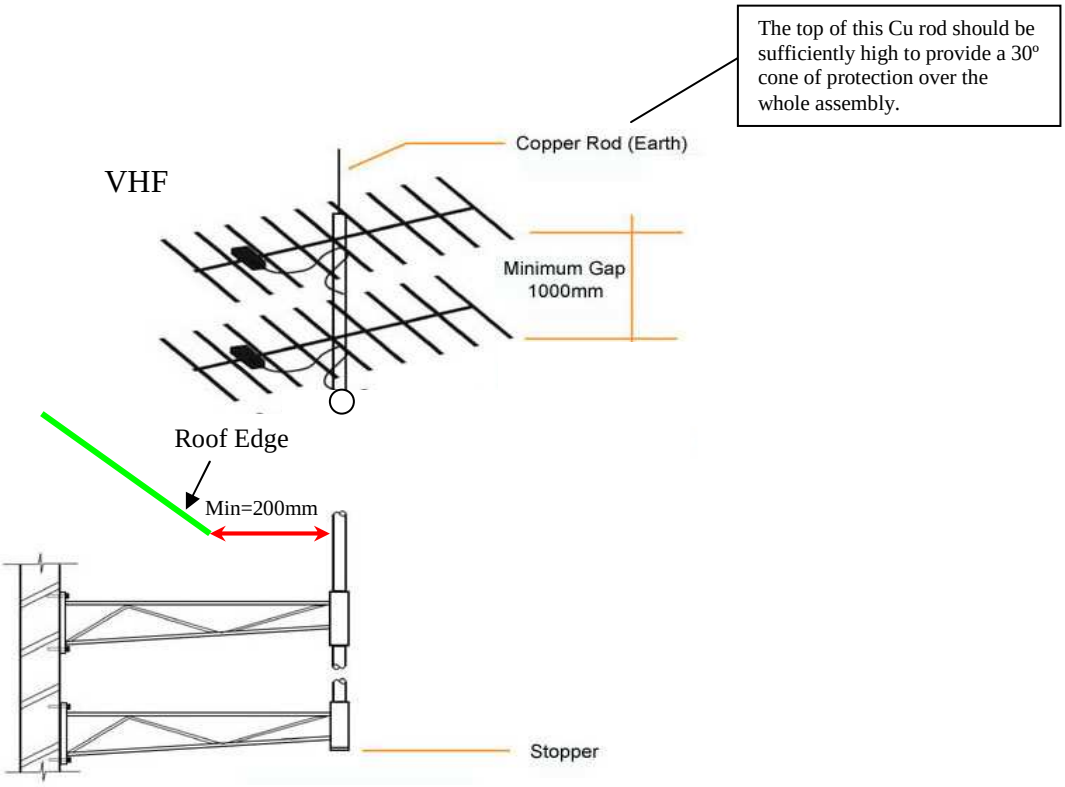


Figure 1 (ii) Side View

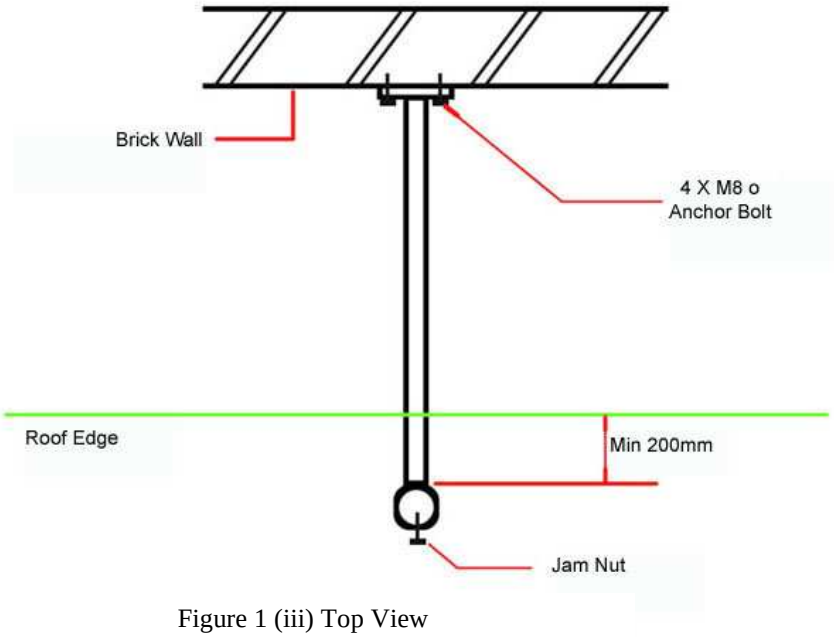


Figure 1 (iii) Top View

4.1.3 Satellite Dish Installation

The installation of a satellite dish requires attention to potential microwave interference sources, the exact satellite and transponders to be received.

As in the installation of antenna, line of sight is the most important point to be considered when choosing a site for satellite dish mount installation. See Figure 2(i) and Figure 2(ii) for good installation location and Figure 2(iii) and Figure 2(iv) for bad installation locations. Always seal all holes drilled to install the satellite mount. This is to prevent any leakage into the building. The important points to be considered when installing satellite dish are the setting and fine tuning of the Elevation, Azimuth and the LNB skew angle.

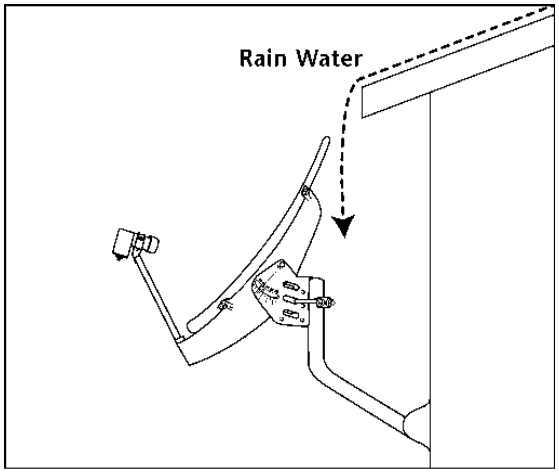


Figure 2 (i) Good, cleared from running water

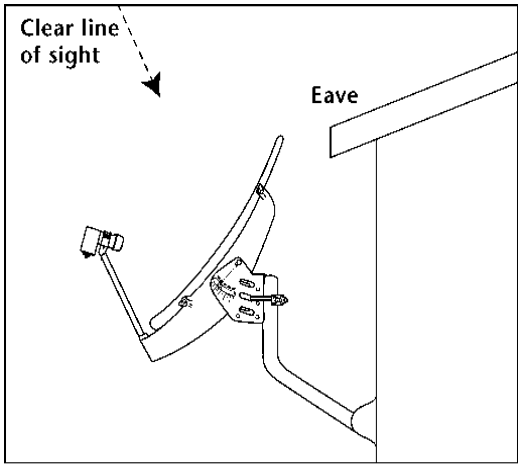


Figure 2 (ii) Good, cleared from eave

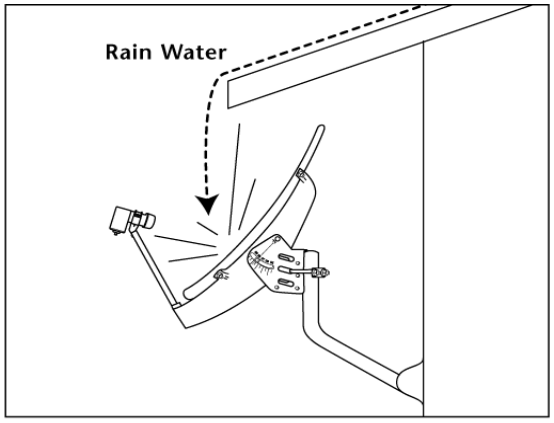


Figure 2 (iii) Bad, in the path of running water

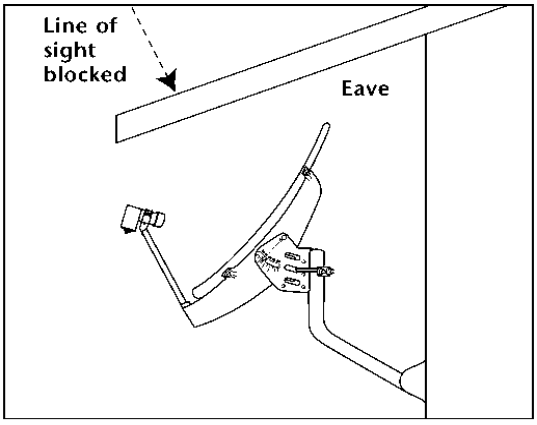


Figure 2 (iv) Bad, blocked by eave

4.1.4 Pole and Bracket

The installation of pole and bracket is a vital part of the antenna installation. Improper pole and bracket installation will result in inconsistent picture quality and unnecessary maintenance. There are some important procedures to be followed:

a) Use only metal raw plug and screw to install on concrete base.

b) Use self-tapping screw when installed on wooden base.

c) The minimum size of pole should be 25 mm diameter and

d) Pole lengths of more than 2000mm should be sufficiently rigid to support the antenna, wall mounted and fixed at min 2 points to the wall.

4.1.5 Cable

Installation of cables from the antenna to the head-end is critical. This is because it is susceptible to weather factor and it can also pick up stray signals if it is not properly installed. There are some important procedures to be followed during installation. i.e.

a) Ensure that all connectors (Crimping type, compression type or screw type) are properly installed.

b) Cable braids should not be protruding out of the connector.

c) Center conductor should not come into contact with any other metallic parts of the cable. (Metallic foil and braids).

d) Seal cable termination using a water proofing material.

e) Cables should not be deformed or crushed. The bending radius of the cable should be a minimum of 10 times the cable diameter.

f) An allowance of 0.5 m minimum should be added to the length of the cable for future maintenance.

g) Install a drip loop at the end of vertical part of the cable to prevent rain water from seeping into the conduit and trunking.

h) All cables should be fastened to the pole by using a cable tie. The cable tie should be installed 0.5m apart.

i) All cable should be tagged. The tag should indicate the channels and the transmission station. E.g.: A01/RTM1/KLT, Cable no. A01/Channel RTM1/ Transmission station is KL Tower;

j) A fire resistant material should be used to seal the entrance of the conduit/ trunking into the building.

Cable specification shall be at least equivalent or better than the *Annex A* and *B*.

4.1.6 Metal Conduit

Trunking or 25 mm G.I conduit should be installed to run the horizontal cable from the antenna to the Broadcast Head-end Room or the trunking. The trunking or GI conduit shall be grounded for

protection against lightning and to act as shielding against interference. In the event of only G.I. pipe being used to run the cable to the Broadcast Head-end Room, a minimum of 1 spare conduit must be installed for maintenance and future expansion. The spare conduit shall be installed from roof top to Broadcast Head-End Room with temporary seal.

a) All metal conduit/ trunking should be coated with rust resistant paint and

b) All cable must be in conduit/ trunking complying to 50% space factor requirement.

4.2 HEAD-END

The head-end is where all the signals are filtered, up or down converted, balanced and amplified before being distributed

4.2.1 Equipment Installation and Arrangement

Since this is an area where a comparatively large number of equipment and cables are installed, all equipment and cable should be wall mounted or rack mounted and arranged in a proper manner to facilitate quick and effective maintenance.

Head-end cabinets should be manufactured exclusively from metal. These cabinets should show high quality finishing, being most appropriate complement for a well-assembled head-end.

Cabinets generally should be electrical tested, build in with back and upper blowing units and come with lockable door to avoid unauthorized access to the equipment. Equipment rack should be transportable with lockable wheels.

The recommended head-end equipment arrangements are indicated in figures below. Refer to Figure 3 and Figure 4.

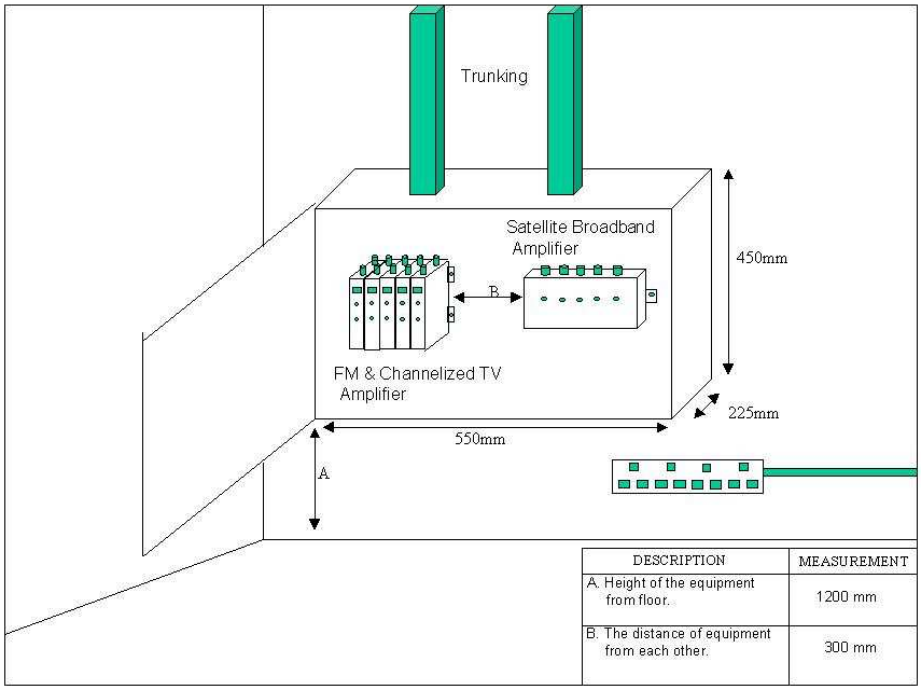


Figure 3. Recommended Head-end Equipment Arrangement (Wall Mounted Type)

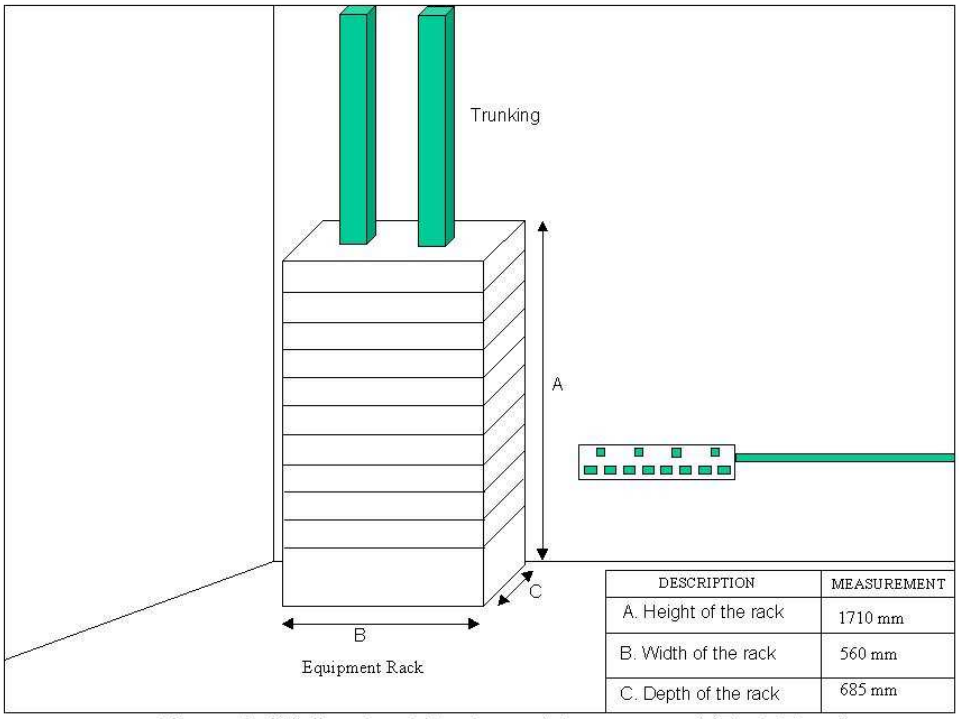


Figure 4. Recommended Head-end Equipment Arrangement (Rack Mounted Type)

4.2.2 Labeling

Similarly all cables should also be tagged according to 4.1.5 (i)

4.2.3 Lightning Surge Protector

All cable from the terrestrial TV antenna must be equipped with lightning surge protector to minimize the possibility of damage from any lightning strike. Lightning arrestor should be connected to the building ground.

4.2.4 Grounding

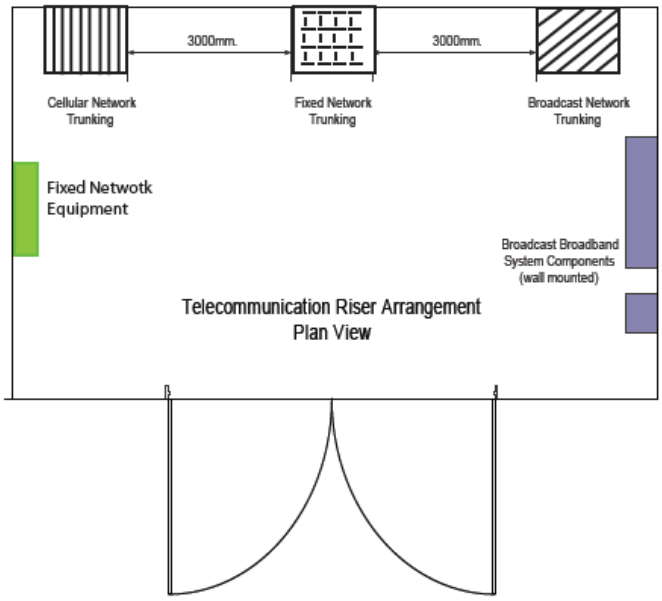
All equipment should be grounded to the building grounding system via copper grounding bar, which should be installed in the Telecommunication Room.

4.3 Riser

The riser may be shared with the other communication providers, all cables and equipment should be installed according to the space allocated. All cables and equipment should be properly tagged.

4.3.1 Equipment Installation and Arrangement

All Broadcast equipment inside the riser should be installed on the right-hand side of the wall. All equipment should be installed on a secured orderly manner either on a wooden board or PVC box (See Figure 5). All unused port should be terminated by using 75-Ohm terminator/dummy load.



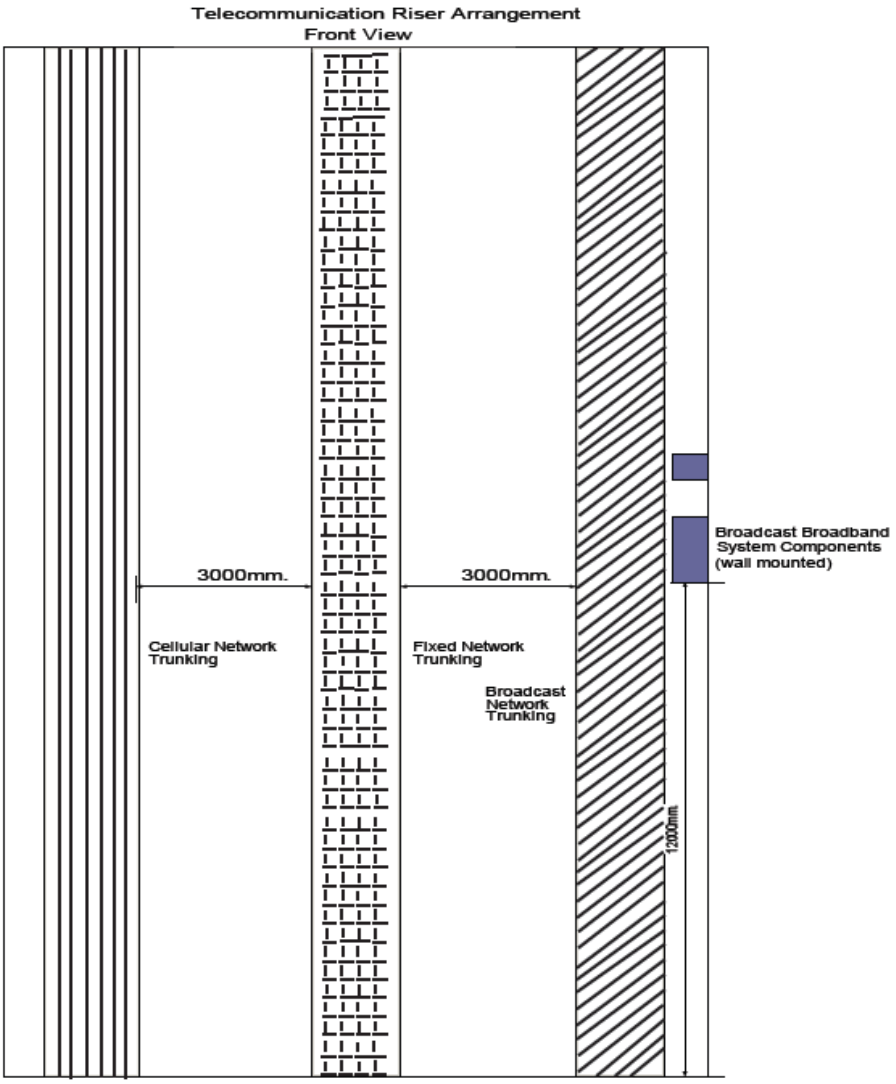


Figure 5. Telecommunication Riser Arrangements

4.3.2 Vertical Cable Installation and Arrangement

Vertical cables for Broadcast Services should be installed on the right-hand side of the cable trunking inside the riser. Use only approved distribution cable (Refer to cable specification in 3.5.1). Only F-type connectors 75 Ohm impedance should be used for installation.

Vertical cable shall be equivalent or better than specified as per Annex A.

4.4 Horizontal Cabling

4.4.1 Cabling Installation

Horizontal cabling should be installed in a trunking along the corridor. The Horizontal cable should not be looped from 1 unit to another. Ensure that the cables are not damaged and the bending radius is at least 10 times the diameter of the cables. Use only approved distribution cables.

Horizontal cable shall be equivalent or better then specified as per Annex B.

4.4.2 Conduit/ Trunking Installation

All trunking installed for horizontal cabling should be installed firmly on the ceiling by using screws or suspension rods. Refer to Table 3: Horizontal Trunking.

4.5 Home Unit

4.5.1 Termination

All cables in the home unit should be terminated by using a DC block wall socket. The wall socket should have 3-connector wall outlet for Terrestrial TV, FM radio and for Satellite TV reception. All wall sockets are preferably be installed close to the telephone socket. The wall sockets should be 150 mm away from the nearest power point. The wall sockets outlet shall be surface mounted or flush in wall mounted.

5. Technical Specifications

5.1 Testing Procedures for Signal Survey – Prior to Antenna Installation

A signal survey prior to installing the system can help to avoid problems. An antenna, a field spectrum analyzer, a portable color TV, and the appropriate service provider's receivers are the equipment required.

If at all possible, use the type and size antenna that will be installed at the site. If this is not possible, use an antenna that has a known gain (dipole) so that the actual signal level for the proposed antenna may be determined.

In weak signal areas, antenna location is usually a critical factor. A lateral distance of only 50 meter can produce vastly different signal levels. Antenna height can also make a difference. Although signals normally become stronger as the antenna is raised this is not always true. Optimum height should always be determined at actual site.

The field spectrum analyzer is used to measure the amount of signal received on each channel. These levels should be recorded for future use (refer to Annex D). With these measurements, equalizing signal levels becomes a simple matter, and the need for any preamplifier becomes apparent. Since antenna location is important, the measurement should be taken at several points

at the site. The point with the best overall signals should be chosen as the optimum location for the antenna installation.

The picture quality should also be considered and this is achieved by using the portable TV and the receiver unit.

5.2 Testing Procedures for Commissioning – After Installation

Upon the completion of the installation work, a thorough physical inspection should be carried out to determine that all necessary equipment is in place, and properly installed. Each device, connector and cable of poor workmanship should be replaced as it would lead to signal ingress or egress if it is left unattended.

A complete test shall be conducted on the whole Broadcast Broadband System and every service that is available should be measured based on the parameters given in the section 5.4 and the performance shall comply according to section 5.5.

5.3 Measurement Method

The installer has to take the signal and picture quality measurement at the points indicated below.

5.3.1 Roof Top

a) Terrestrial
   i) Antenna - Signal level reading and picture quality

b) Satellite
   i) KU Band Dish, at LNB output

5.3.2 Head-end

   i) Signal level before the amplifier.

   a) Signal level after the amplifier.

   b) Picture Quality and

   iv) Teletext Quality

5.3.3 Last Component before Socket Outlet

5.3.4 Signal level, CNR and/ or BER at the last component in the system

5.3.5 Within the Units

5.3.6 Signal level, CNR and/ or BER at all broadcast socket outlets

5.3.7 Picture Quality

5 = Excellent
4 = Good
3 = Fair
2 = Poor
1 = Bad

The installer is required to tabulate all the result from signal and picture quality measurement based on the form indicated in Annex D and E.

5.4 Performance Specifications

Table 6. Performance Specifications

Point of Measurement	System/ Services	Requirement
Minimum Signal Level at Antenna/ Dish	Terrestrial analog	≥ 75 dBµV
	Terrestrial digital	≥ 65 dBµV
	FM Radio	≥ 60 dBµV
	Satellite Dish	≥ 70 dBµV
Minimum Signal Level at the Broadcast Socket	Terrestrial analog	63dBµV – 80dBµV and CNR ≥ 40dB
	Terrestrial digital	40dBµV – 80dBµV CNR ≥ 38dB
	FM Radio	≥ 54 dBµV
	Satellite QPSK Signal	55dBµV – 80dBµV and BER (after Viterbi) ≤ 2 X 10^{-8}

5.5 Test Equipment

5.5.1 Field spectrum analyzer for Satellite and Terrestrial services

5.5.2 Recommended features shall include but not limited to the following:

a) Continuous tuning from 5 to 862 MHz and 950 to 2150 MHz.

b) RF Input Impedance, 75 Ohm.

c) Digital Readout to be absolute value calibrated at least in dBµV.

d) Measurement for Terrestrial Bands .

e) Analogue Channels: Signal Level, Carrier-to-Noise Ratio, Video-Audio Ratio.

f) Digital Channels: Channel Power and Carrier-to-Noise Ratio.

g) Measurement for Satellite Band.

h) Analogue Channels: Signal Level and Carrier-to-Noise Ratio.

i) Digital Channels: Channel Power, Carrier-to-Noise Ratio and Bit Error Rate.

j) Spectrum Analyzer mode and

k) Monitor Display, Color System: PAL and TV Standard: B, G (for picture quality assessment).

5.5.3 Receiver/Decoder for the dedicated digital terrestrial, MMDS and Satellite Services

5.5.4 Dipole Antenna (for signal reception survey)

6. Testing

6.1 Tools

The majority of the tools and equipment you will need for most installation are common. The following is the list of useful tools and miscellaneous materials that might be handy during an installation.

6.1.1 Basic Tools

a) A complete set of nut driver (spin tight).

b) A set of ratchets and sockets.

c) A pocket compass, for orienting the antenna and when the compass bearing(s) of the transmitter tower(s) is known.

d) A drill with a wide assortment of bits.

e) A good quality tool belt.

f) Cable stripper.

g) Caulking compound for sealing the holes where the cables enters the house.

h) Roofing tar (Plastic roof cement), for sealing around screws on the roof.

i) Silicone grease for waterproofing coaxial cable connector.

j) A sledge hammer for driving in ground rods and.

k) A strong step ladder (In addition to extension ladders)

6.1.2 Specialized Tools

a) A crimping tool for fastening coaxial connector.

b) A signal level meter to measure the incoming signal level

7. Definitions

For the purposes of this TSIR, the followings definitions apply.

Approval Authority	:	It is embodied in the CMA, SDBA, UBBL and TCPA that approval from the State Authority or Local authority or any other authority is a must before any development or construction activities can be carried out. In approving a development or building plan, the State Authority or local authority must satisfy all requirements pertaining to essential services which should in accordance with the proposal above include public utility services in line with the CMA 1998.
Attenuation	:	Signal loss in a transmission medium or component expressed in dB
Azimuth	:	The magnetically corrected compass bearing (360 degrees) for locating an orbiting communication satellite
BBS (Broadband Broadcast System)	:	Is a network of coaxial cables and components in the frequency range of 5 MHz – 2150 MHz. It receives broadcasting signals from a common antenna/dish or system of antennas, centrally integrates and distributes the signal and to all outlets within the building.
BER (Bit error rate)	:	Bit Error Rate - In a digital transmission, BER is the percentage of bits with errors divided by the total number of bits that have been transmitted, received or processed over a given time period. The rate is typically expressed as 10 to the negative power.
Broadcast Head-end Room	:	A dedicated secured room to locate all necessary receiving and processing equipment and components for the Broadband Broadband System
Building	:	Shall have the same meaning provided for the National Land Code 1965, and shall mean to include any structure erected on land.
Building owner	:	The actual proprietor of a building, or its agents or its authorized personnel.
Campus Style Property	:	A property with single document of title issued to a single proprietor of any land which parcel of land is not sub-divided.
Cellular Network	:	A mobile communications network system.
Civil Infrastructure	:	Basic communications infrastructure installation needed for the establishment of fixed network communications network services such as pits, ducts, manholes and etc. but does not include a line.
CMA	:	Communication and Multimedia Act (1998)

CNR	:	Carrier-to-noise ratio is the ratio of the level of the carrier to that of the noise in the desired frequency band, expressed in dB.
Commercial Building	:	A building or portion thereof, that is intended for office use.
dB (decibel)	:	A unit of measurement which expresses changes in signal power levels along a logarithmic scale. 3 dB represents a multiplication factor of 2; 10dB a factor of 10; 20 dB a factor of 100; 30 dB a factor of 1000; etc.
Developer	:	Any person, body of person, company, firm or society (by whatever name described), who or which engages in or carries or undertakes or causes to be undertaking housing development.
DMT	:	Digital Multimedia Terminal – An indoor unit that can receive authorized signals for television, radio, data and interactive services from the satellite dish. It can be connected to the television set, hi-fi stereo, computer and telephone.
Drip Loop	:	Several inches of slack in a cable that prevents water from collecting on the cable or running along the surface of the cable. A drip loop between the LNB and the entry point in to the building also allows free movement of the Dish while adjusting it.
Duct	:	Means a single or multi-way duct made of P.V.C. or other materials. An enclosed raceway for wires or cables usually used in soil or concrete an enclosure in which air is moved.
DVB	:	Digital Video Broadcasting Standards – An increasingly global format specifies modulation and coding schemes for each mode of transmission – satellite, cable, microwave and terrestrial.
EIRP (Effective isotropic radiated power)	:	The measurement in dBμV of a satellite transmission.
Elevation	:	The angle (0 to 90 degrees) at which the antenna tilts up towards the sky.
F- Connector	:	A coaxial connector for use with cables which have a characteristic impedance of 75 ohms.
Filters	:	Used in the head end to eliminate undesired frequencies and provide interference-free reception
Floor Distributor	:	The distributor is used for generic / structured cabling in the commercial building. Its to connect between the horizontal and other cabling sub-systems or equipment.
Frequency	:	The number of times in which an alternating current goes through a complete cycle of 360 degrees in one second of time.
Gain	:	The amplification factor for communications devices expressed in dB. For antennas, gain is expressed in dB, decibels referenced to an isotropic reference antenna.

Generic / Structured Cabling	:	A structured communication cabling system, capable of supporting a wide range of applications. Generic cabling can be installed without prior knowledge of the required applications. Application specific hardware is not a part of the generic cabling
GHz	:	The prefix Giga means billion, and Hertz means cycles per second. Signals in the GHz range are often called microwaves.
Housing Development	:	Develop or construct or cause to be constructed in any manner more than 4 units of housing accommodation and shop house in, on, over or under any land with the view of selling the same.
IEC	:	International Electrotechnical Commission. An organization that sets international electrical and electronics standards.
Infrastructure	:	Any telecommunications plant and shall include post, ducts, manholes, relay, rack, cable racks, cable ladders, terminal frames, backboards, concrete slabs, riser passage, risers and the like, but does not include a line.
Interactive Services	:	These enable subscribers to use the television to shop, bank, and make travel arrangements and play interactive games. They are provided independently or in conjunction with television and radio programs. Distance learning is another example of an interactive service supported by the system.
Internal telecommunication wiring	:	Any telecommunications line cable, wire, optical fiber, conduits or other physical media required to connect customer's terminal equipment and the network termination unit at the Private Property Boundary.
IPTV	:	Internet Protocol Television Television and/or video signals are distributed to subscribers using Internet protocols. Often this is in parallel with the subscriber's Internet connection, supplied by a broadband operator using the same infrastructure.
Ku-Band	:	A high frequency satellite band that makes the use of small satellite dishes possible. There are 14 Ku-band transponders on Measat-1 and Measat-2 which can provide a maximum of 140 television channels. Many additional radio and data services are also possible.
Line	:	A wire, cable, optical fiber, wave guide or other medium used or intended for use as a continuous guide for or in connection with carrying telecommunications, but does not include infrastructure.
LNB	:	Low noise Block Converter – The electronic device is mounted at the center of the satellite dish and collects signals and down converts the frequency before feeding it to the DMT via the satellite cable.
MHz	:	The prefix mega means million, and Hertz means cycles per seconds.

MMDS	:	Multichannel Multipoint Distribution Services. It is a wireless telecommunications technology used as an alternative method for cable television programming reception. Reception of MMDS-delivered television signals is done with a special rooftop microwave antenna and a set-top box for the television receiving the signals.
Multi Network Provider	:	More than one Network Provider.
Multi Storey Building	:	Any building of multi levels which requires a telecommunication riser for the provision of internal distribution cables to the customers by the Network Providers.
Network Facilities Provider	:	Means a person who owns or provides any network facilities.
Network Service Provider	:	Means a person who provides network services
Network Provider's Equipment	:	Any apparatus, device, line, infrastructure, interfacing device or equipment used or intended to be used in connection with a telecommunications network to supply telecommunication services.
Noise Figure(NF)	:	The noise figure is usually expressed in decibels (dB), and is with respect to thermal noise power at the system impedance, at a standard noise temperature (usually 20^{o} C, 293 K) over the bandwidth of interest.
Office Building	:	Any building that is intended for office use.
Private Property Line	:	The boundary between the Network Provider and the customer's property to determine the termination point for the Network Provider for the provisioning of infrastructure.
QPSK (Quadrature Phase Shift Keying)	:	It is a phase modulation algorithm where the phase of the carrier wave is modulated to encode bits of digital information in each phase change.
Residential Premise	:	A parcel of land consisting of buildings designed, adapted or used for residential habitation and shall include semi-detached buildings, detached building and terrace house.
RF	:	Radio Frequency (known as HF in some countries).
Riser	:	An utility room specific to accommodate cabling, component for services related to Fixed Network, Broadcasting, Cellular and Wireless.
Satellite Dish	:	The outdoor unit which collects signals from the satellite. ASTRO subscribers can receive its service using parabolic antennas as small as 60cm in diameter.
SDBA	:	Street, Drainage and Building Act, 1974

Semi-Detached House / Semi-D House.	:	Any building designed to be built as one pair having a party wall as one of its walls.
Shop House	:	Any building or any part of the building designed, adapted or used for business purpose and shall be of four storey or less, and shall include any building of alight industrial nature, such as factories.
Splitters	:	Divide the input signals equally, providing the same amount of signal at each output of the splitter.
Subscribers Distribution Frame (SDF)	:	A connecting unit between external and internal lines. It allows for public or private lines coming into the building to connect to internal networks.
Tap-Off	:	Is a means of delivering signal from the distribution lines to the outlet, while providing enough isolation to prevent the sets from interfering each others
TCPA	:	Town and Country Planning Act, 1976
Telecommunication Closet (TC)	:	An enclosed space for housing telecommunication equipment, cable terminations and cross-connect cabling.
Telecommunication Room	:	A space provided by building owner for a Network Providers to enable the supply of telecommunication service to the customer.
Telecommunications Network	:	A system or series of systems for carrying, conveying or transmitting telecommunications.
Telephony Cable	:	A plain old telephone system (POTS) cable.
Terrace House	:	Any residential building designed as a single dwelling unit and forming part of a row or terrace of not less than three such residential buildings.
Transponder	:	Equipment on the satellite that receives signals from earth stations and sends them back to receiving satellite dish. The transponders can be switched between various countries in the satellite's footprint.
UBBL	:	Uniform Building By Laws
UHF	:	Ultra High Frequency (470MHz – 862MHz)
VHF	:	Very High Frequency (47MHz – 446MHz)

Annex A
(Normative)

Recommended Minimum Cable Specifications I

Mechanical Specifications

- Type : IF Coaxial Cable – RG 11
- Inner conductor : 1.55 ± 0.01mm Copper Cover Steel
- Dielectric : Formed Polyethylene
- Diameter over dielectric : 7.25 ± 0.2mm
- Outer conductor : copper braid + copper foil
- Foil : copper
- Braiding : 96 X 0.15mm 6 mm bare copper
- Coverage braiding :60%
- Diameter over screen : 7.9 ± 0.25mm
- Sheath : PVC White
- Diameter over sheath : 10.1 ± 0.3mm
- Minimum wall thickness : 0.7mm
- Minimum static bend radius : 100mm
- Minimum temporary setting radius : 100mm
- Adhesion of dielectric : 12 – 120 N at 25mm
- Total weight : 80.0 kg/km

Electrical Specifications

- Characteristic impedance : 75 ± 3 Ω
- DC loop resistance : $\leq$ 20.0 Ω/Km
- Inner conductor : $\leq$ 9.4 Ω/Km
- Outer conductor : $\leq$ 10.6 Ω/Km
- Capacitance : $\leq$ 55 pF/M ± 2 pF/m
- Velocity ratio : 0.81 $\pm$ 0.02
- Insulation resistance : > 10^4 MΩ/km
- Nominal attenuation at given frequencies :

FREQUENCY	LOSSES	FREQUENCY	LOSSES
5 MHz	0.9 dB/100m	1000 MHz	16.4 dB/100m
50 MHz	3.0 dB/100m	1350 MHz	20.4 dB/100m
100 MHz	4.3 dB/100m	1600 MHz	22.5 dB/100m
200 MHz	6.2 dB/100m	1750 MHz	23.6 dB/100m
400 MHz	9.2 dB/100m	2150 MHz	26.3 dB/100m
600 MHz	11.2 dB/100m	2400 MHz	28.5 dB/100m
800 MHz	13.0 dB/100m		

-
- Return Loss

5 - 30 MHz : $\geq$ 23 dB*
30 - 470 MHz : $\geq$ 23 dB*
470 - 862 MHz : $\geq$ 20 dB*
862 – 2150 MHz : $\geq$ 18 dB*
Screening efficiency (A) : 30-1000 MHz : $\geq$ 85 Db

Annex B
(Normative)

Recommended Minimum Cable Specifications II

Mechanical Specifications

- Type : IF Coaxial Cable – RG 6
- Inner conductor : 1.00 ± 0.02mm Copper Covered Steel
- Dielectric : Formed Polyethylene
- Diameter over dielectric : 4.8mm ± 0.15mm
- Outer conductor : Copper + bare copper braiding
- Foil : Copper Foil,
- Braiding : 128 X 0.12mm bare copper
- Coverage braiding : 90 %
- Diameter over screen : 5.34mm ± 0.15mm
- Sheath : PVC White
- Diameter over sheath : 6.9 ± 0.2mm
- Minimum wall thickness : 0.4mm
- Minimum static bend radius : 70mm
- Nominal wall thickness : 0.69mm
- Adhesion of dielectric : 7.8 – 78 N at 25mm
- Total Weight : 44 kg/km

Electrical Specifications

- Characteristic impedance : 75 ± 3 Ω
- DC loop resistance : ≤ 41.0 Ω/Km
- Inner conductor : ≤ 23.0 Ω/Km
- Outer conductor : ≤ 18.0 Ω/Km
- Capacitance : 54 Pf/m ± 2 pF/m
- Velocity ratio : 0.82 ± 0.02
- Insulation resistance : > 10^4 MΩ/km
- Nominal attenuation at given frequencies :

FREQUENCY	LOSSES	FREQUENCY	LOSSES
5 MHz	1.8 dB/100m	800 MHz	18.9 dB/100m
50 MHz	4.7 dB/100m	1000 MHz	21.8 dB/100m
200 MHz	9.5 dB/100m	1350 MHz	25.4 dB/100m
300 MHz	11.0 dB/100m	1750 MHz	29.0 dB/100m
400 MHz	12.8 dB/100m	2150 MHz	32.8 dB/100m
500 MHz	15.65 dB/100m	2400 MHz	34.2 dB/100m

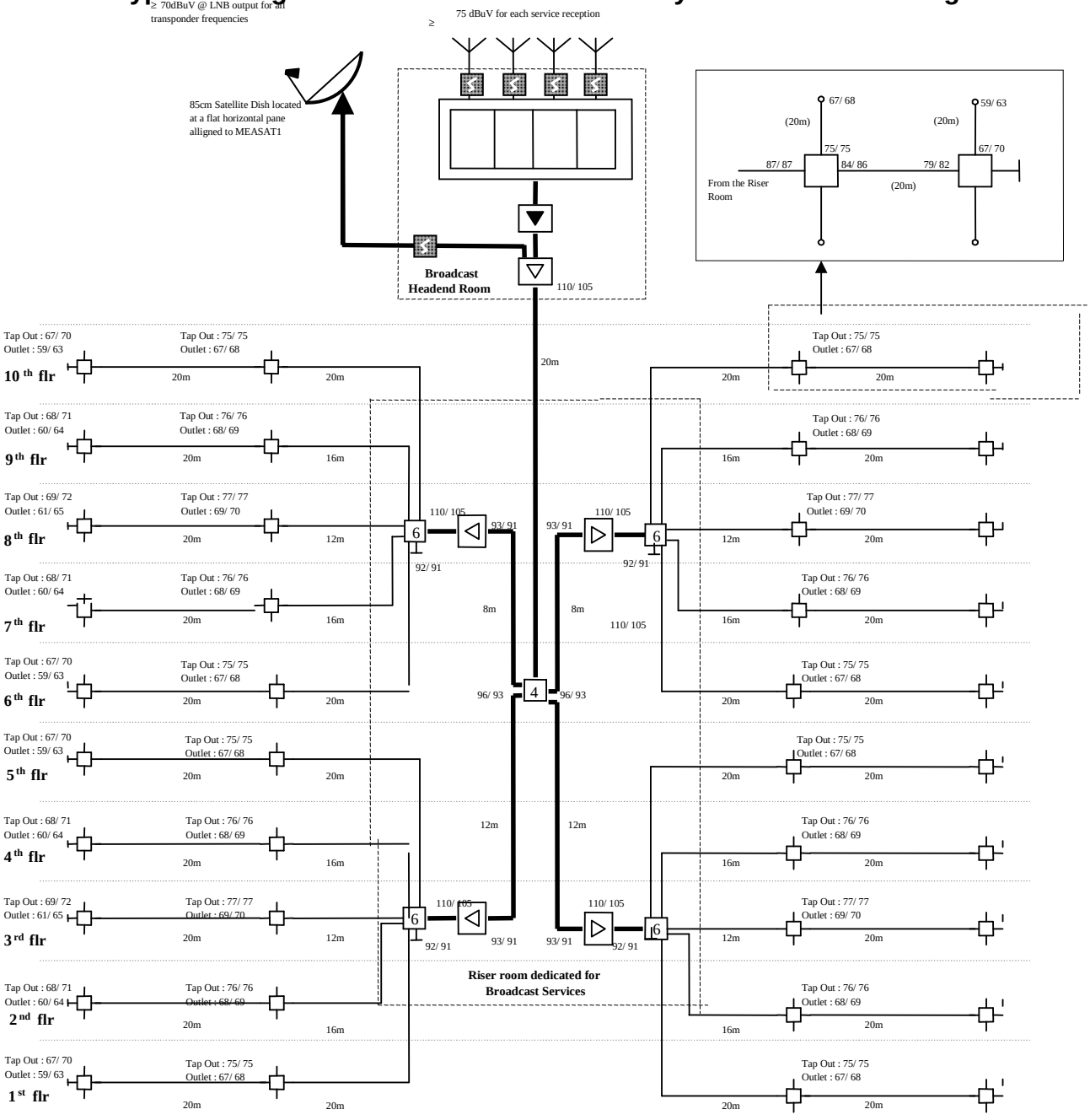
-
- Return Loss

5 - 30 MHz : ≥ 23 dB*
30 – 470 MHz : ≥ 23 dB*
470 - 862 MHz : ≥ 20 dB*
862 - 2400 MHz : ≥ 18 dB*

* Max 3 peak values 4 dB lower than specified
Screening efficiency(A) : 30 - 1000 MHz ≥ 85 d

Annex C
(Normative)

Typical Design of a Broadcast Broadband System Schematic Diagram



*** All outlets measurement must comply to (BER ≤ 2 x 10 -4) and (CNR ≥ 43dB) for Sat and TV respectively.**

LEGEND :

- 2 Way Tapoff 11dB
- 4 — 4Way UBB Splitter
- 6 — 6 Way UBB Splitter
- Satellite Amp. 5 - 2150MHz
- Sat/ TV/ socket outlet
- 75 ohm terminator
- RF Amplifier 5 - 862MHz
- CABLE : Series 11 (2,400MHz)
- CABLE : Series 6 (2,400MHz)
- Lightning Surge Protector

Note: 67/ 70 = 67dB uV at 1350MHz
70dBuV at 800MHz

Example of Wiring Arrangement of a Broadcast Broadband System in a 10 - Storey Highrise Building

Designed By:	Approved By:
Date:	Reference:

The actual wiring arrangement may differ from building to building depending on the actual requirement

ANNEX D
(Normative)

Broadcast Broadband System

Test Result Sheet (Main page)

Company : _____ Date : _____

_____ Ref. No. : _____

Name of Dwelling : _____ Block No. : _____

Address : _____ _____

_____

Roof Top

Channel	Signal Level (dBμV)	Carrier to Noise Ratio	Picture Quality	Remark

Head End

Channel	Amplifier/ Modulator Type	Signal Level (dBμV)		Picture Quality (1 – 5)	Teletex Quality (1 – 5)	Remarks
		Before	After			

Issued by: Installed by: Approved by:

Name : _____ Name: _____ Name: _____

Designation: _____ Designation: _____ Designation: _____

ANNEX E
(Normative)

Broadcast Broadband System

Test Result Sheet (continuation page)

Last Component Before Socket Outlet

Level	Signal Level At Broadcast Broadband Socket													
	Satellite [Signal Level, dBuV (BER)]				Analog Terrestrial [Signal Level, dBuV (C/N)]					Digital Terrestrial [Signal Level, dBuV]				
	1	2	3	4	TV1	TV2	TV3	NTV7	TV8	1	2	3	4	5

Within the Units

Unit No.	Signal Level At Broadcast Broadband Socket													
	Satellite [Signal Level, dBuV (BER)]				Analog Terrestrial [Signal Level, dBuV (C/N)]					Digital Terrestrial [Signal Level, dBuV]				
	1	2	3	4	TV1	TV2	TV3	NTV7	TV8	1	2	3	4	5

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